CLAIMS

1. A honeycomb structural body, in which a plurality of cells, penetrating between a pair of end faces in the direction of the A axis and functioning as fluid passages, are formed by honeycomb shaped porous cell walls made of cordierite as a main constituent,

wherein said cordierite which is a main constituent of said cell walls consists, in a chemical composition, of 30~45% by mass of alumina (Al_2O_3), 11~17% by mass of magnesia (MgO) and 42~57% by mass of silica (SiO_2),

and is possessed of the following physical properties (1) through (5):

(1) porosity: 55~75%,

(2) open frontal area: 0.55 or more, less than 0.65,

(3) mean pore size: 20~30 μ m,

(4) compression strength in the A axis: 2.0 MPa or more, and

(5) a ratio of the "compression strength in the A axis / Young's modulus": 1.2×10^{-3} or more.

2. A honeycomb structural body, in which a plurality of cells, penetrating between a pair of end faces in the direction of the A axis and functioning as fluid passages, are formed by honeycomb shaped porous cell walls made of cordierite as a main constituent,

wherein said cordierite which is a main constituent of said cell walls consists, in a chemical composition, of 30~45% by mass of alumina (Al_2O_3), 11~17% by mass of magnesia (MgO) and 42~57% by mass of silica (SiO_2),

and is possessed of the following physical properties (1), (3), (6) and (7):

(1) porosity: 55~75%,

(3) mean pore size: 20~30 μ m,

(6) bending strength: 2.0 MPa or more, and

(7) a ratio of said "bending strength / Young's modulus": 1.2×10^{-3} or more.

3. A honeycomb structural body, in which a plurality of cells, penetrating between a pair of end faces in the direction of the A axis and functioning as fluid passages, are formed by honeycomb shaped porous cell walls made of cordierite as a main constituent,

wherein said cordierite which is a main constituent of said cell walls consists, in a chemical composition, of 30~45% by mass of alumina (Al_2O_3), 11~17% by mass of magnesia (MgO) and 42~57 %by mass of silica (SiO_2),

and is possessed of the following physical properties (1) , (3), (8) and (9):

(1) porosity: 55~75%,

(3) mean pore size: 20~30 μ m,

(8) rate of thermal expansion: 1.5×10^{-6} /K or less, and

(9) absolute value of difference of rate of thermal expansion: 0.2×10^{-6} /K or less.

4. A honeycomb structural body, in which a plurality of cells, penetrating between a pair of end faces in the direction of the A axis and functioning as fluid passages, are formed by honeycomb shaped porous cell walls made of cordierite as a main constituent,

wherein said cordierite which is a main constituent of said cell walls consists, in a chemical composition, of 30~45 % by mass of alumina (Al_2O_3), 11~17 % by mass of magnesia (MgO) and 42~57 % by mass of silica (SiO_2),

and is possessed of the following physical properties (1) , (3) and (10):

(1) porosity: 55~75%,

(3) mean pore size: 20~30 μ m, and

(10) specific surface area: 0.3~1.0m^2/g.

5. A honeycomb structural body according to Claim 1, further is possessed of the following physical properties (6) and (7) in addition to the physical properties (1) through (5):

(6) bending strength: 2.0 MPa or more, and

(7)a ratio of said "bending strength / Young's modulus": 1.2×10^{-3} or more.

6. A honeycomb structural body according to Claim 1, further is possessed of the following physical properties (8) and (9) in addition to the physical properties (1) through (5):

(8) rate of thermal expansion: 1.5×10^{-6} /K or less, and

(9) absolute value of difference of rate of thermal expansion: 0.2×10^{-6} /K or less.

7. A honeycomb structural body according to Claim 1, further is possessed of the following physical property (10) in addition to the physical properties (1) through (5):

(10) specific surface area: 0.3~1.0m^2/g.

8. A honeycomb structural body according to Claim 1, further is possessed of the following physical properties (6) through (10) in addition to the physical properties (1) through (5):

(6) bending strength: 2.0 MPa or more, and

(7) a ratio of said "bending strength / Young's modulus": 1.2×10^{-3} or more.

(8) rate of thermal expansion: 1.5×10^{-6} /K or less,

(9) absolute value of difference of rate of thermal expansion: 0.2×10^{-6} /K or less, and

(10) specific surface area: 0.3~1.0m^2/g.

9. A honeycomb structural body according to any one of Claim 1 through Claim 8, wherein said cell walls have substantially uniform (1) porosity and (3) mean pore size at both of the surface portion and the central portion.

10. A method for producing a honeycomb structural body, comprising:

a forming process including kneading and shaping a forming material having a cordierite forming material, a pore forming material and a diffusion vehicle to obtain a honeycomb shaped body, in which a plurality of cells, penetrating between a pair of end faces in the direction of the A axis and functioning as fluid passages, are formed by honeycomb shaped cell walls, and a firing process firing said honeycomb shaped body to obtain a

honeycomb shaped porous honeycomb structural body having cordierite as a main constituent,

wherein using original material containing following proportion of following (I) alumina (Al_2O_3) original material, (II) magnesia (MgO) original material and (III) silica (SiO_2) original material as said cordierite forming material so that a chemical composition of cordierite, which is a main constituent of said cell walls, constituting obtained honeycomb structural body is 30~45% by mass of alumina (Al_2O_3), 11~17% by mass of magnesia (MgO) and 42~57% by mass of silica (SiO_2),

(I) alumina (Al_2O_3) original material: granular alumina (Al_2O_3) including 50% or more of a material having the grain diameter of 10~20 μ m (18 % by mass or more against total mass of said cordierite forming material),

(II) magnesia (MgO) original material: at least one material selected from the group of talc, magnesium hydrate and magnesium oxide having average grain diameter of 10 μ m or less (20 % by mass or more against total mass of said cordierite forming material),

(III) silica (SiO_2) original material: fused silica or silica gel (10 % by mass or more against total mass of said cordierite forming material).

11. A method for producing a honeycomb structural body according to Claim 10, wherein 9% or more by mass of kaolin or calcined kaolin having an average grain size of 10 μ m or less, is used as (I) alumina (Al_2O_3) original material and (III) silica (SiO_2) original material against total mass of said cordierite forming material.

12. A method for producing a honeycomb structural body according to Claim 10 or Claim 11, in which obtained honeycomb structural body is possessed of the following physical properties (1) through (5):

(1) porosity: 55~75%,

(2) open frontal area: 0.55 or more, less than 0.65,

(3) mean pore size: 20~30 μ m,

(4) compression strength in the A axis: 2.0 MPa or more, and

(5) a ratio of the "compression strength in the A axis / Young's modulus": 1.2×10^{-3}or more.

13. A method for producing a honeycomb structural body according to Claim 10 or Claim 11, in which obtained honeycomb structural body is possessed of the following physical properties (1), (3), (6) and (7):

(1) porosity: 55~75%,

(3) mean pore size: 20~30 μ m,

(6) bending strength: 2.0 MPa or more, and

(7) a ratio of said "bending strength / Young's modulus": 1.2×10^{-3} or more.

14. A method for producing a honeycomb structural body according to Claim 10 or Claim 11, in which obtained honeycomb structural body is possessed of the following physical properties (1), (3), (8) and (9):

(1) porosity: 55~75%,

(3) mean pore size: 20~30 μ m,

(8) rate of thermal expansion: 1.5×10^{-6} /K or less, and

(9) absolute value of difference of rate of thermal expansion: 0.2×10^{-6} /K or less.

15. A method for producing a honeycomb structural body according to Claim 10 or Claim 11, in which obtained honeycomb structural body is possessed of the following physical properties (1), (3), and (10):

(1) porosity: 55~75%,

(3) mean pore size: 20~30 μ m, and

(10) specific surface area: 0.3~1.0m^2/g.

16. A method for producing a honeycomb structural body according to any one of Claim 10 through Claim 15, wherein said cell walls obtained have substantially uniform (1) porosity and (3) mean pore size at both of the surface portion and the central portion.